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Logbook analysis for the 4WX herring purse seine fishery, 1985-89

by

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ABSTRACT

Results of purse seine logbook analysis from the 1989 4WX herring fishery are presented and compared with similiar analyses since 1985. Logbook coverage was again high (94% of Statistics Branch reported landings) and the quality of the data comparable to previous years. In general there was a decrease in effort consistent with reduced market opportunities. Logbook analysis also documented a substantial decrease in both effort and catch on Trinity Ledge since 1988 and increases on the Long Island shore, near Seal Island and in the upper Bay of Fundy. The detailed nature of the logs allows documentation of various aspects of the 4WX herring fishery that would otherwise be speculative. As the logbook program continues, efforts are being made to improve collaboration with the captains involved through the provision of feedback on individual logbooks as well as summary reports. While purse seine catch rates have not generally been useful as abundance indicators, the detailed information in this logbook data set will allow exploration of the use of more specific search and set rate indices.

RÉSUMÉ

Les résultats de l'analyse des journaux de bord des pêcheurs à la senne coulissante pour la pêcherie de harengs de 4WX de 1989 sont présentés et comparés avec les résultats d'analyses semblables réalisées depuis 1985. La couverture réalisées par les journaux de bord était encore une fois élevés (94 % des débarquements signalés de la Direction des données statistiques) et la qualité des données a été comparable à celle des années antérieures. Règle générale, on observe une diminution de l'effort qui concorde avec le rétrécissement des marchés. L'analyse des journaux de bord a également permis de documenter la diminution substantielle de l'effort et des prises dans la région de la chaussé Trinity depuis 1988 et des augmentations le long de la côte de l'île Long, près de l'île Seal et dans la partie supérieure de la baie de Fundy. La nature détaillée des journaux permet de documenter divers aspects de la pêche aux harengs de 4WX qui, autrement, relèveraient de la spéculation. Pendant que le programme des journaux de bord se poursuit, on entreprend des efforts pour améliorer la collaboration avec les capitaines concernés par l'intermédiaire d'une rétroaction concernant les journaux de bord individuels ainsi que par l'intermédiaire de rapports récapitulatifs. Bien que les taux de prise de la pêche à la senne coulissante ne se soient pas généralement montrés utiles comme indicateurs de l'abondance, l'ensemble de données détaillées provenant des journaux de bord permettra d'explorer l'utilisation d'indices plus spécifiques par recherche au sonar et fréquence de moulillage des engins.

Introduction

A purse seine logbook, designed to provide better and more complete information on a set by set basis for each trip, was introduced into the Bay of Fundy herring fishery in 1985. Previous reports (Power and Stephenson 1986,1987) have dealt with log development and design, and have summarized the first two years of use. Material dealing with the logs were presented in 1988 and 1989 and results of logbook analysis were incorporated into the main 4WX herring assessment documents (Stephenson and Power 1988,1989). In this paper we present results from the 1989 4VWX purse seine fishery and also compare the 5 years (1985 to 1989) of new format logbook data.

Methods

In 1989 as in previous years, logbook submission was a condition of license. Logs were submitted to fishery officers or to licensing offices. Some initial comparisons are made by the Statistical Co-ordinator with the hail reports and purchase slips for recorded catches. The logbook was then sent to the Biological Station, St. Andrews for processing rather than to Statistics Division as is the case for most other fishery logs. All logs were coded by personnel familiar with the fishery, and care was taken to ensure that all fields were interpreted correctly and consistently. Logs were matched where applicable with corresponding commercial samples for access to length-frequency and detail information. As has been done since 1987, comments were formally coded to allow quantification of anecdotal information including school size, abundance and fish behaviour. A further improvement in quality has been achieved since 1988 through better editing verification and more complete assignment of catch locations to fishing grounds.

Use of logs

The main use of purse seine logbooks in recent years has been to document the progress of the fishery including total catch and effort (ie. trips, sets, hours searching) by individual fishing areas and time intervals. The logs were also very useful in documenting other aspects of the fishery including market and fish condition (size and roe) as well as release patterns and anecdotal comments. As in previous years, logbook information was used to partition summer purse seine catches and biological sample data by 10 minute square and month, for development of

separate age-length keys. This has been expanded since 1988 so that all purse seine fishery components (rather than just 4X summer) were treated in this manner.

CPUE calculations are consistent here in that they are all calculated on a trip by trip basis (which is usually one night of fishing) with any missing data excluded. Thus CATCH/HR.= TOTAL CATCH/TOTAL HRS. as averaged together for only those trips with valid TOTAL HRS.

Fisheries

The purse seine is the largest gear component of the 4WX herring fishery (accounting for 95% of the stock catch in 1989) and it is active for most months of the year in a wide range of areas (See Scotia Fundy Herring Fisheries Management Plan, p4.; Anon,1989). Within each area, however, the fisheries are predictable in location and timing. As a result, the data have been grouped based on 10 minute square numbers into fishing grounds for this analysis (Fig. 1) which generally conform to historical areas fished as described in the logbooks. Purse seine fisheries in 4WX run on a 'quota year' from Oct. 15 of the current year to Oct. 14 of the following year and are reported as such in this document.

Catches in the 4W fishery in Chedabucto Bay are usually from 5 to 10 thousand tons and are taken from November to March depending on markets and weather conditions. The 1989 distribution of catches in the mouth and entrance of Chedabucto Bay (Fig. 2) was typical of recent years but represents a change of distribution from a decade ago when much of the catch was made just outside or to the south of the mouth of Chedabucto Bay.

The 4X fall-winter fishery is located off southern New Brunswick and takes place from Oct. to March. Catches for this component are limited to a proportion of the TAC and are generally less than 8000 t. Catches in recent years include a large proportion of adults and have been in the Grand Manan area (Fig. 3) with some effort along the N.B. coast. This distribution is also different from that of a decade ago when it was a 'brit' fishery which took place along the coast west of Saint John.

The 4X summer purse seine fishery is the largest and is distributed more widely (Fig 4). There are only small localized catches in May, with more widely distributed effort in June and

July, then followed by more localized fisheries on spawning grounds in August, September and the first half of October. The roe fishery has been the most important market component in recent years and the quality and condition of fish caught is well documented in the logs. The presence of the upper Bay of Fundy roe fishery is new since 1988. Unlike the other spawning grounds, total catch in this area was limited by quota regulation. One other spawning area, Trinity Ledge, has been controlled since 1987 through spawning closures in August and September. In 1989 Trinity Ledge was closed for a total of 18 days.

Logbook coverage and summary of results

Logbooks from the 1989 fishery were received for most trips from 37 of 39 active vessels. One vessel was inactive and another vessel (Ocean Leader) replaced the Norcha which sank in 1988.

"Kept" (=sold) catch recorded on logs accounted for 94 % of the official Statistics total for the summer purse seine fishery (Table 1). This represents an improvement over 1988 which may be linked to the large TAC and lack of markets and thus a possible improvement in reporting. Better completion of the logbooks may also be the result of the captains receiving reports of their individual logbook data each year with comments for suggested improvements.

In general we feel that the quality of the information is excellent and we continue the practice of sending our analysis of logbook data to the individual purse seine captains. This 'feedback' consists of a number of reports or plots specific to the individual including :

- Plot(s) by 10 minute square for his boat for the year
- Report by night and set of his individual catches with all codes
- Summary report by month and week for the individual
- Copy of the relevant CAFSAC Res. Doc. on logbooks when available
- Covering letter with annotated comments of suggestions how the individual log could be improved.

Appendix 1 illustrates one example of these reports.

Hail reports compiled by the Yarmouth Statistical office for each vessel were compared with catches recorded in logbooks. The resulting text table below demonstrates that the quality of catch recording for 1987 through 1989 has remained similar:

	% of landed catch logged					Total #
	<59	60-69	70-79	80-84	90-100	boats
# boats 1987	4	4	3	12	17	40
# boats 1988	4	4	3	10	19	40
# boats 1989	8	1	1	4	25	39

There was an improvement in the top category with the logs of 25 boats showing better than 90% agreement, but also a deterioration in the < 59% category. The 8 poor vessel records accounted for about 5000 t (or 8% of the total purse seine catch) not recorded in the logs. Part of these discrepancies can be attributed to a difference in the way the Yarmouth Statistics office allocates catch to individual boat quotas. In our logbook data, only what a boat reported as 'caught' is recorded. Any amounts due to pooling, or receiving fish from another vessel (carried by that boat) are not included.

Again in 1989, logbooks were generally well completed and the quality and quantity of information was comparable to previous years (Table 3). A few fields, notably 'Search Time' and 'Set Date' were less well completed in 1988 and 1989 but this is partially due to the inclusion of logs from 4W, 4Xb and 4Vn in this summary. Logs from these areas tend to be somewhat poorer due to the lack of a weekly licensing and log collection system which is in place for the 4Xa summer fishery. The ratio to Statistics catch is also notably poorer for these areas as shown in Table 2.

Release codes (Table 4) provide reasons for rejected sets or for lack of catch in an attempted set. Release codes were assigned to 29% of all records in the summer fishery data (Table 3,4) but only accounted for 5% or 2969 t. of logged catch. This is consistent for the series (ie. release codes are assigned in all cases where no catch is made). Thus in Table 4. 'Occurrence on logs' explains why fish were not caught and 'Reported Releases' explains why fish which were caught were released.

In 'Reason for Releases' there were increases in 1989 in size related releases and in dogfish causing aborted sets. The

increase in size releases were as expected with limited and more selective markets this year. The dogfish problem, with 4 times the incidence of the previous year echoes anecdotal comments from fishery sources. The main reduction in release reason was for 'condition' which can be explained by the large decrease of roe markets. There was also a decrease in feed problem over the 1988 season.

Comparisons of released tonnage between years is difficult since an estimate of the total catch is rarely given and a few large estimates tend to bias the overall results. Nonetheless the reasons and proportions appear to remain consistent (ie. size, feed, condition, market) between years. The decrease in 'market filled' category was as expected in a year of reduced market opportunities.

Comments were recorded from 17% of the 1987, 24 % of the 1988, and 29 % of the 1989 logs (Table 5). This increase is mostly due to an increased effort in the coding of anecdotal information found in the logs. The most common comments in the three years of information have been "large area of fish", "large bunches or schools", and "pooling of catch". The fishery concerns about fish quality are also being echoed in the 1988 and 1989 data with more comments on 'Feed' or 'Lack of feed'.

Market records (Table 6) show the large decrease in the roe fishery of over 19,000 kept t. This is likely a slight underestimate of that market, because a portion of the landings coded as "adult shore" were also processed for roe. The other domestic market components remained stable with only slight decreases in tonnage landed. Over the past 2 years, the O.S.S. market has increased to 31% of the total market from only 1% in in 1986.

Reconstruction of the 1989 fishery by fishery ground and month (Table 7) shows the dominance of the Long Island area in June and July and Seal Island, German Bank in Sept. and Oct.

The total catch was down by 25% in 1989 primarily due to markets but total searching was only reduced by 10%. Catch per hour was also down (Table 9a,10) to 15 t/hr from 23 t/hr in 1988 indicating smaller catch per trip and is presumably due to known market constraints.

Set rate has remained relatively constant within areas over the years (Table 9b,10) but there appears to be notable differences between major fishery areas (4W, 4Xa, 4Xb). This

may be partially due to the difference in quality of the logbooks between areas but a major proportion of total catch was still accounted for in the logbooks and so the data must be considered representative. These data show the changes in total catch and searching by fishery with general decreases in 4Xa and increases in 4Xb and 4W. Accompanying this there has been a decrease in catch and set rates for 4Xb and 4W whereas these rates have remained remarkably constant in 4Xa despite large decreases in overall effort.

Total effort and catch rates by month are presented in Table 11 and 12. In the case of the summer 4Xa fishery there is a general consistency in these rates between months and years. The main variability shows up particularly in the beginning and end of the season and illustrates the need to consider temporal aspects of the fishery.

Total effort and catch rates by fishery and year are presented in Table 13. This documents the temporal and spatial changes that have been occurring with the substantial decreases in 4Xa and relatively large increases in 4W and 4Xb.

Effort

The dominance of fishing areas in the major summer fishery has changed. Search effort in the 1989 fishery was highest off Long Island (45%) and Seal Island (28%) rather than Trinity Ledge which has been predominant and received between 26 and 41% of the total effort in the years 1985 to 1988. In 1989 the Trinity Ledge area received only 2% of the total effort and accounted for less than 1% of the catch in that fishery. (Table 7,8)

This lack of fish on Trinity was well known in the industry but the catch rates as reflected by catch per hour and set per hour do not seem to reflect the magnitude of the decrease.

Catch rates in Scots Bay remained high, perhaps reflecting markets available for these spawning fish. German Bank however seems to be showing a large decrease after remaining high for several years. This may be an availability problem due to the depth of water and effects of weather in this area.

Conclusions

The use of purse seine effort series as a stock abundance indicator has many theoretical problems due to assumptions about school densities and school sizes as well as effects due to the

behavior of the fishing fleet as a whole. In spite of the potential limitation, this catch effort series is being compiled in the hope that the detail, high coverage and the quality of information will be sufficient to allow their use. Calculations such as catch per hour searching (sonar hours) and set rate (sets per sonar hour) are on a finer scale than has been used previously and may make this series more useful. However, their other uses; especially in documenting the fishery, make logbooks indispensable in compiling the 4WX herring stock assessment.

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Table 1. Historical logbook coverage of 4X summer purse seine fishery.

Year	Total # nights fishing	Total # of success nights	% successful nights	Total # of sets	Total log catch(t)	Total statistics catch(t)	% logged catch	Catch per night	Catch per successful night	Catch per set	Total logged search hours	Catch per hour searched	Sets per hour searched
1967	-	-	-	-	-	117832	-	-	-	55.4[a]	-	-	-
1968	-	-	-	-	-	133267	-	-	-	52.8[a]	-	-	-
1969	-	-	-	-	-	84525	-	-	-	41.7[a]	-	-	-
1970	-	-	-	-	-	74849	-	-	-	39.0[a]	-	-	-
1971	-	-	-	-	-	35071	-	-	-	32.6[a]	-	-	-
1972	-	-	-	-	-	61158	-	-	-	45.0[a]	-	-	-
1973	403	363	90	550	17603	36618	48	43.7	48.5	32.0	-	-	-
1974[b]						76859				53.4[a]	-	-	
1975[b]						79605				57.4[a]	-	-	
1976[b]						58395				44.6[a]	-	-	
1977	1137	863	76	1203	32143	68538	47	28.3	37.2	26.7	-	-	-
1978	701	551	79	950	21734	57973	37	31.0	39.4	22.9	-	-	-
1979	641	261	41	422	8565	25265	34	39.4	96.8	20.3	-	-	-
1980	1273	1134	89	1399	32921	44986	73	35.3	39.7	23.5	-	-	-
1981	638	539	84	706	18764	53799	35	29.4	34.8	26.6	-	-	-
1982	229	160	70	320	6751	64344	10	29.5	42.1	21.1	-	-	-
1983	1348	1207	90	1772	47071	63379	74	34.9	39.0	26.6	-	-	-
1984	530	503	95	730	26560	58354	46	50.1	52.8	36.4	-	-	-
1985	1802	1539	85	2297	83323	87167	96	46.2	54.1	41.2	5157	26.6	0.62
1986	1424	1258	88	1852	51625	56139	92	36.3	41.0	31.5	4519	18.1	0.59
1987	1796	1540	86	2218	68257	77306	88	38.0	44.3	34.6	5753	19.5	0.59
1988	1916	1666	87	2908	85741	98371	87	46.5	53.5	29.5	5868	22.7	0.55
1989	1609	1333	83	1916	64207	68089	94	39.9	48.2	33.5	5333	15.0	0.51

[a]From Stephenson et al. (1986), CAFSAC Res. Doc. 86/43.

[b]Entirely 4W logs.

Table 2. 1988-1989 4VWX Monthly Herring Statistics Branch Landings & Purse Seine Logbook Catches (kept t).

		1988			1989									
Fishery	Data Source	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
4W	Statistics Branch		1917	1218	3021	13								3484	3292	12945
4W	Kept Catch, Logbooks		2811	1043	2538	14								3257	2254	11917
	Ratio "Stats"/"kept"		.7	1.2	1.2	.9								1.1	1.5	1.1
4Xa	Statistics Branch								9229	18218	12424	18776	9442			68089
4Xa	Kept Catch, Logbooks							41	9011	17045	10987	19360	7763			64207
	Ratio "Stats"/"kept"								1.0	1.1	1.1	1.0	1.2			1.1
4Xb	Statistics Branch	288			2498	2183	927						1311	1456	56	8719
4Xb	Kept Catch, Logbooks	82			2233	1726	777						458	278	0	5554
	Ratio "Stats"/"kept"	3.5			1.1	1.3	1.2						2.9	5.2	n/a	1.6
4VN	Statistics Branch		1088	1484										296	1782	4650
4VN	Kept Catch, Logbooks		980	1188										360	970	3498
	Ratio "Stats"/"kept"		1.1	1.2										.8	1.8	1.3

Table 3. Summary of data coverage by field for 1985-1989 4X purse seine logs

Field	Occurence in 1989	Percent occurence 1985	1986	1987	1988 ‡	1989 ‡‡
Vessel	37 of 39; 2025 trips	100	100	100	96	98
Departure date	2025 of 2025 trips	100	100	100	100	100
Trip time (hrs)	1521 of 2025 trips	83	80	81	79	75
Search time (hrs)	1297 of 2025 trips	65	71	71	65	64
Set date	1879 of 2607 records	81	86	76	69	72
Set number	2390 of 2607 records	91	94	93	94	92
Start set time	1879 of 2607 records	75	78	74	68	72
Position type	unspecified	4	2	.4	.1	.5
	lat/long	8	6	18	44	46
	Loran C	32	30	31	20	18
	Square #	15	13	17	10	5
	Interpreted	41	38	35	26	31
Total catch/set	2115 of 2607 records	84	84	84	84	81
Kept catch/set	2075 of 2607 records	82	84	82	83	80
Release catch/set	67 of 2607 records	3	1	3	2	3
Catch units	unspecified	56	16	17	16	18
	Metric ton	6	3	6	15	14
	Short ton	38	81	78	68	68
	Hogshead	.2	.3	.1	1	1
Release code	745 of 2607 records	21	20	28	25	29
Size of fish	1087 of 2607 records	19	20	23	28	42
Roe condition	466 of 2607 records	14	27	28	20	18
Market code	2215 of 2607 records	76	84	78	95	85
Comments code	769 of 2607 records	-	-	17	24	29

‡ 1988 summary also includes data from 4W, 4Xb, and 4Vn (449 records).
‡‡ 1989 summary also includes data from 4W, 4Xb, and 4Vn (513 records).

Table 4. Release data from 1985 to 1989 4X summer purse seine logbooks

Reason for release	Occurence on Logs % of total sets					Reported Releases % of released tonnage				
	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
No release code	78.8	80.4	72.5	74.2	74.8	4.5	.0	11.1	2.6	.9
Size of fish	3.0	1.0	1.6	1.3	4.2	41.7	2.9	8.1	13.1	42.5
Feed	1.1	.1	1.1	2.1	.8	6.2	.0	2.2	4.6	2.1
Condition	.9	2.5	3.1	2.5	1.7	.6	41.2	26.1	38.6	6.1
Dogfish	1.7	.6	.8	1.0	4.0	6.9	2.0	1.9	3.4	12.2
Tore up	1.3	1.3	1.9	1.5	.8	3.1	2.7	4.1	.8	.0
Set too large	.4	.4	.9	.9	.3	16.2	3.7	31.9	18.5	.9
Market filled	1.3	.2	.6	.3	.2	6.9	10.1	.5	5.7	1.5
Skunk set	1.8	1.8	1.5	2.2	1.8	.0	.3	.2	.1	.0
Other Species	.1	.4	.3	.1	.2	.8	.0	.0	.0	.0
Set too small	.4	.1	.2	.4	.4	.1	.1	.2	1.1	.3
No fish found	3.3	3.7	2.7	3.4	.1	.0	.0	.0	.0	.0
Fish too deep	.9	1.8	2.4	1.4	1.2	.1	.1	.0	.3	.0
Poor weather	.9	.8	1.9	.9	.2	.0	.0	.0	.0	.0
Gear/crew problems	.6	.9	1.4	1.4	1.9	.1	7.8	3.0	.0	.6
Fish too shallow	1.1	.4	1.9	1.3	.2	.0	.0	.0	.0	.0
Fish dove		.2	.5	.2	.3		2.7	9.2	3.0	.0
Net sunk	.3	.6	.1	.5	.6	12.5	26.4	.0	3.0	24.4
Fish thinned out		.4	.3	.8	1.3		.0	.0	.0	.2
Fish moving fast		.6	.5	.2	.2		.0	.0	.0	.0
Fish inside box/line		.3	.3	.2			.0	.0	.0	.0
Gave fish away				.0	1.9			.0	.0	1.5
Unknown reason	2.2	1.6	2.3	2.0	3.2		.0	1.5	5.2	65.9
Total No. of Observations	2471	1964	2382	2636	1916					
Total Released Catch (t.)						2968	1341	3330	3012	2969

Table 5. Summary of comments coded from 1987 to 1989 4X summer purse seine logs

	Occurence on logs					
Year	1987	1988	1989	1987	1988	1989
	Number of records			Percent all records		
Comment code						
Not specified	1971	1991	1319	82.7	75.5	68.8
Fish thinned out	50	44	21	2.1	1.7	1.1
Small bunches/schools	26	30	16	1.1	1.1	.8
Large area of fish	194	172	144	8.1	6.5	7.5
Little or no fish	14	17	7	.6	.6	.4
Poor bottom	15	13	3	.6	.5	.2
Whales	16	3	6	.7	.1	.3
Brit sighting	1		1	.0	0	.1
Large bunches/schools	40	41	17	1.7	1.6	.9
Hard to catch	25	39	31	1.0	1.5	1.6
Fish on surface	5	6	12	.2	.2	.6
Fish in shallow water	1	37	14	.0	1.4	.7
No feed in fish	21	122	152	.9	4.6	7.9
Pooling of catch	3	66	34	.1	2.5	1.8
Fish deep		21	23		.8	1.2
Some feed in fish		30	35		1.1	1.8
Fish very fat		1			.0	0
Gave fish away		3			.1	0
F.O. hail			8			.4
Split market			9			.5
Catch not recorded			18			.9
Warmer water than normal			5			.3
Poor weather			17			.9
Carrying			24			1.3
Total number of records	2382	2636	1916	100	100	100

Table 6. 1985 to 1989 Market Components for the 4X Summer Herring Purse Seine Fishery.

4X Market	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
	Kept tons. ‡‡					Percent kept tons				
Over-the-Side	7359	644	5072	21755	19149	9.	1.	8.	25.	31.
Sardine	1576	2548	1580	99	57	2.	5.	2.	0.	0.
Bait	892	1472	1667	449	1950	1.	3.	3.	1.	3.
Roe	25320	22723	28844	32509	12725	32.	44.	44.	38.	21.
Adult Shore	30867	20408	20619	29361	23383	38.	40.	32.	34.	38.
Fillet	32	45	240	410	651	0.	0.	0.	1.	1.
U.S. Buyers	282	176	277	23	64	0.	0.	0.	0.	0.
Unspecified	14144	3630	6675	1135	2202	18.	7.	10.	1.	4.
Stringer					27					0.
Split Markets					1035					2.
Total	80472	51646	64974	85741	61243	100.	100.	100.	100.	100.

‡‡ Note use of 'Kept tons' rather than 'Total tons' caught to reflect catches which actually 'went to market'.

Table 7. 1989 4VWX Monthly Herring Purse Seine Logbook Catches (t) by Fishery and Grounds.

Fishery	Grounds	Jan.	Feb.	Mar.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
4W	Chedabucto Bay	2538	14								3257	2254	8063
4W	Unknown Areas												
4W	Total	2538	14								3257	2254	8063
4Xa	Grand Manan					11	367			590			968
4Xa	Long Island					7368	12715	1639	84	109			21915
4Xa	Trinity							18	248				266
4Xa	Lurcher								18				18
4Xa	Gannet, Dry Ledge					305	27	105	1442	131			2010
4Xa	Seal Island						2388	4004	12688	4339			23419
4Xa	German Bank				41	1308	83	197	3974	2485			8088
4Xa	Scots Bay						1235	4713	635				6583
4Xa	N.B. Coastal						115			108			223
4Xa	S.W. Grounds					19	36	220					275
4Xa	Unknown Area						79	91	271				441
4Xa	Total				41	9011	17045	10987	19360	7762	0	0	64206
4Xb	Grand Manan	1760	524	220							458	278	3240
4Xb	Long Island												0
4Xb	N.B. Coastal	473	1201	556									2230
4Xb	Totals	2233	1725	776							458	278	5470
4VN	Sydney Bight										360	970	1330
4VN	Unknown Area												0
4VN	Total										360	970	1330

Table 8a. 4VWX Herring Catch: 1985 to 1989 Total Effort by Fishery and Grounds.

Fishery	Grounds	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
		Total Catch in Tons					Total Searching in Sonar Hours				
4W	Chedabucto Bay	4216	6871	4468	7319	8062	135	164	181	385	233
4W	Unknown Areas	746	959	1893			17	32	66		
4W	Total	4962	7830	6361	7319	8062	152	196	247	385	233
4Xa	Grand Manan	3584	2984	2217	301	968	184	284	220	27	77
4Xa	Long Island	857	3060	7309	10892	21915	149	292	771	827	2406
4Xa	Trinity	35800	13419	18851	18586	266	2110	1650	1700	1506	97
4Xa	Lurcher	308			2928	18	39	8		162	14
4Xa	Gannet, Dry Ledge	5675	2187	1474	14901	2010	526	203	162	1187	229
4Xa	Seal Island	13745	8894	11560	18947	23420	718	542	1086	1133	1517
4Xa	German Bank	15502	13346	16434	17692	8087	679	873	985	789	644
4Xa	Scots Bay		36	3649	3949	6583		5	256	184	310
4Xa	S.W. Grounds	558	1839	184	181	223	47	175	28	11	26
4Xa	N.B. Coastal		621	138	126	276		33	9	33	1
4Xa	Unknown Area	7294	5240	6443		440	709	452	561		6
4Xa	Total	83323	51626	68259	88503	64206	5161	4517	5778	5859	5338
4Xb	Grand Manan	1332	2814	2135	4197	3240	26	169	125	162	194
4Xb	Long Island		252	215	18			32	10	3	
4Xb	Trinity	94									
4Xb	Seal Island	123									
4Xb	German Bank			66					8		
4Xb	N.B. Coastal	188		966	692	2231			74	27	167
4Xb	Unknown Areas	36	44	16					6		
4Xb	Totals	1773	3110	3398	4907	5471	26	201	223	192	361
4VN	Sydney Bight	3511	4250	1751	2100	1330		26	29	1	11
4VN	Unknown Area		236		68						
4VN	Total	3511	4486	1751	2168	1330		26	29	1	11

Table 8b. Changes in the relative importance of key fishing grounds in the 4X summer purse seine fishery.

Fishery	Grounds	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
		Total Catch in Tons					Total Searching in Sonar Hours				
4Xa	Long Island	857	3060	7309	10892	21915	149	292	771	827	2406
4Xa	Trinity	35800	13419	18851	18586	266	2110	1650	1700	1506	97
4Xa	Seal Island	13745	8894	11560	18947	23420	718	542	1086	1133	1517
4Xa	German Bank	15502	13346	16434	17692	8087	679	873	985	789	644
4Xa	Scots Bay		36	3649	3949	6583		5	256	184	310
4Xa	Total	83323	51626	68259	88503	64206	5161	4517	5778	5859	5338
		Percentage of Total Catch					Percentage of Total Searching				
4Xa	Long Island	1	6	11	12	34	3	6	13	14	45
4Xa	Trinity	43	26	28	21	0	41	37	29	26	2
4Xa	Seal Island	16	17	17	21	36	14	12	19	19	28
4Xa	German Bank	19	26	24	20	13	13	19	17	13	12
4Xa	Scots Bay	0	0	5	4	10	0	0	4	3	6
4Xa	Total	79	75	85	79	94	71	74	83	76	93

Table 9a. 1989 4VWX Monthly Herring Purse Seine Catch Rate (t/hr searching) by Fishery and Grounds.

Fishery	Grounds	Jan.	Feb.	Mar.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
4W	Chedabucto Bay	23.4	6.8								28.3	18.3	25.1
4W	Average												25.1
4Xa	Grand Manan					1.3	9.8	0		115.5			51.8
4Xa	Long Island					12.3	9.4	4.4	2.6	35.4			10.0
4Xa	Trinity					0	0	0	20.6				9.0
4Xa	Lurcher					0			2.8				1.4
4Xa	Gannet, Dry Ledge					2.3	.6	1.4	16.3	15.5			10.5
4Xa	Seal Island				0		7.2	24.9	17.5	23.5			18.3
4Xa	German Bank				0	13.2	9.0	0	11.2	13.5			11.8
4Xa	Scots Bay						27.7	26.6	7.3				24.0
4Xa	S.W. Grounds					6.4	5.3	13.6					10.5
4Xa	N.B. Coastal						n/a						
4Xa	Unknown Area						1.8		0				.9
4Xa	Average												15.0
4Xb	Grand Manan	23.8	8.0	37.5						25.9	22.8		21.3
4Xb	Long Island												
4Xb	N.B. Coastal	20.1	12.5	8.5									13.0
4Xb	Average												18.4
4VN	Sydney Bight										63.6	52.1	55.9
4VN	Unknown Area												
4VN	Average												55.9

Table 9b. 1989 4VWX Monthly Herring Purse Seine Numbers of Sets/hr Search by Fishery and Grounds.

Fishery	Grounds	Jan.	Feb.	Mar.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
4W	Chedabucto Bay	.78	.50								1.10	.49	.88
4W	Average												.88
4Xa	Grand Manan					.44	.39			1.89			1.04
4Xa	Long Island					.47	.37	.23	.12	.70			.40
4Xa	Trinity						.18		.50				.45
4Xa	Lurcher					.13			.15				.14
4Xa	Gannet, Dry Ledge					.20	.14	.41	.68	.78			.54
4Xa	Seal Island						.37	.60	.53	.58			.53
4Xa	German Bank					.49	1.11		.38	.38			.43
4Xa	Scots Bay						.73	.90	.31				.79
4Xa	S.W. Grounds					.33	.15	.45					.34
4Xa	N.B. Coastal						n/a						
4Xa	Unknown Area						.20		1				.60
4Xa	Average												.51
4Xb	Grand Manan	.90	.45	.72						1.04	1.15		.85
4Xb	Long Island												
4Xb	N.B. Coastal	.53	.51	.29									.47
4Xb	Average												.72
4VN	Sydney Bight										1.50	.81	1.04
4VN	Unknown Area												
4VN	Average												1.04

Table 10. 1985-1989 4VWX Herring Purse Seine CPUE by Fishery and Grounds.

Fishery	Grounds	Catch per hour Searching					Sets per hour searching				
		1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
4W	Chedabucto Bay	42	71	39	34	25	.8	1.1	.9	.7	.9
4W	Unknown Areas	143	60	80			2.1	1.2	1.4		
4W	Average	68	69	52	34	25	1.1	1.1	1.1	.7	.9
4Xa	Grand Manan	28	22	19	9	52	.7	.8	.6	.3	1.0
4Xa	Long Island	16	23	14	21	10	.4	.9	.5	.6	.4
4Xa	Trinity	29	11	13	18	9	.7	.4	.5	.5	.5
4Xa	Lurcher	10			29	1	.2			.7	.1
4Xa	Gannet, Dry Ledge	17	31	17	23	10	.5	.9	.6	.5	.5
4Xa	Seal Island	29	20	16	17	18	.6	.6	.5	.5	.5
4Xa	German Bank	30	21	32	35	12	.6	.6	.7	.7	.4
4Xa	Scots Bay		8	25	28	24		.2	.5	.6	.8
4Xa	S.W. Grounds	34	15	12	13	11	.8	.5	.3	.4	.3
4Xa	N.B. Coastal		33	26	5	n/a		.5	.6	.2	n/a
4Xa	Unknown Area	18	18	26		1	.4	.6	.7		.6
4Xa	Average	27	18	20	23	15	.6	.6	.6	.6	.5
4Xb	Grand Manan	43	22	31	29	21	1.3	1.0	.9	.9	.9
4Xb	Long Island		8	54	6			.5	3.0	.3	
4Xb	Trinity										
4Xb	Seal Island										
4Xb	German Bank			9					.3		
4Xb	N.B. Coastal			11	6	13			.4	.5	.5
4Xb	Unknown Area			3					.2		
4Xb	Average	43	20	26	26	18	1.3	.9	.9	.9	.7
4VN	Sydney Bight		55	30	45	56		1.1	.7	1.0	1.0
4VN	Unknown Area										
4VN	Average		55	30	45	56		1.1	.7	1.0	1.0

Table 11. 1985 to 1989 4VWX Herring Purse Seine Total Effort by Fishery and Month.

Fishery	Month	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
		Total Catch in Tons					Total Searching in Sonar Hours				
4W	1	841	3593	2944	3059	2538	15	33	93	166	120
4W	2				406	14			8	43	2
4W	11	2049	3164	2532	2811	3257	84	110	117	138	62
4W	12	2071	1072	885	1043	2254	54	54	29	38	31
4W	Total	4961	7829	6361	7319	8063	153	197	247	385	215
4Xa	5			24	265	41				15	0
4Xa	6	428	316	4272	11065	9011	29	43	359	723	709
4Xa	7	12926	7251	14136	23315	17045	1277	699	1523	1510	1302
4Xa	8	30054	17875	22179	19396	10987	2158	1777	2242	1945	613
4Xa	9	35590	23662	23656	32674	19360	1558	1827	1473	1548	1018
4Xa	10	4325	2520	4189	1789	7763	139	170	210	128	296
4Xa	Total	83323	51624	68456	88504	64207	5161	4516	5807	5869	3938
4Xb	1	260		1634	2200	2233			62	78	103
4Xb	2				1469	1726				61	149
4Xb	3				1156	777				45	63
4Xb	10	1292	2624	952	82	458	26	159	99	8	34
4Xb	11	221	486	488		278		42	23		14
4Xb	12			108		0			6		
4Xb	Total	1773	3110	3182	4907	5472	26	201	190	192	363
4VN	11	2554	3053	1470	980	360		25	27		2
4VN	12	957	1433	281	1188	970		1	2	1	9
4VN	Total	3511	4486	1751	2168	1330	0	26	29	1	11

Table 12. 1985 to 1989 4VWX Herring Purse Seine CPUE by Fishery and Month.

Fishery	Month	Catch per hour searching					Sets per hour searching				
		1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
4W	1	67	132	59	36	28	.9	1.9	1.3	.7	.7
4W	2				11	7			.3	.5	.5
4W	11	82	44	44	41	50	1.5	.8	.9	.7	1.0
4W	12	51	28	36	31	24	1.0	.4	.7	.6	.5
4W	Average	68	69	51	34	25	1.1	1.1	1.1	.7	.8
4Xa	5				9					.3	
4Xa	6	21	17	14	25	15	.4	.6	.5	.6	.5
4Xa	7	22	16	13	28	15	.5	.5	.5	.7	.4
4Xa	8	22	17	18	14	27	.6	.5	.5	.4	.7
4Xa	9	34	18	27	24	19	.8	.6	.6	.6	.5
4Xa	10	33	38	36	29	35	.7	1.2	.8	.5	.7
4Xa	Average	21	18	19	18	15		.6	.6	.6	.5
4Xb	1			38	29	23			.9	1.0	.8
4Xb	2				24	11				.7	.5
4Xb	3				20	16				.5	.4
4Xb	10	43	23	15	9	26	1.3	1.0	.7	.3	1.0
4Xb	11		7	22		23		.4	.6		1.2
4Xb	12			2					.3		
4Xb	Average	43	20	24	26	18	1.3	.9		.9	.7
4VN	11		34	32		64		.7	.7		1.5
4VN	12		182	18	45	52		4.0	.5	1.0	.8
4VN	Average		55	30	45	56		1.1	.7	1.0	1.0

Table 13. 1985 to 1989 Total Effort and CPUE by Fishery Component.

Year	Fishery	Total Days Fished	Total Hours Searched	Total Number Sets	Total Catch (t)	Catch per Trip	Catch per Hour/ search	Catch per Set	Sets per Hour/ search	Catch per Set/ hour
1985	4W	72	153	101	4961	69	68	56	1.1	29
	4Xa	1802	5161	2297	83323	46	27	41	.6	12
	4Xb	34	26	42	1773	52	43	43	1.3	10
	4VN	32		46	3511	110		89		
1986	4W	113	197	148	7829	69	69	62	1.1	31
	4Xa	1424	4516	1852	51625	36	18	32	.6	9
	4Xb	109	201	129	3110	29	20	25	.9	14
	4VN	42	26	64	4486	107	55	84	1.1	5
1987	4W	120	247	172	6360	53	52	44	1.1	28
	4Xa	1796	5777	2218	68257	38	20	35	.6	9
	4Xb	93	222	105	3397	37	26	35	.9	16
	4VN	25	29	40	1751	70	30	49	.7	7
1988	4W	151	385	202	7319	49	34	51	.7	31
	4Xa	1916	5868	2475	89075	47	23	41	.6	18
	4Xb	164	192	192	4907	30	26	25	.9	24
	4VN	28	1	38	2168	77	45	62		45
1989	4W	154	238	204	8062	52	25	42	.9	19
	4Xa	1609	5333	1916	64207	40	15	32	.5	12
	4Xb	200	361	222	5471	27	18	25	.7	18
	4VN	16	11	26	1330	83	56	52	1.0	33

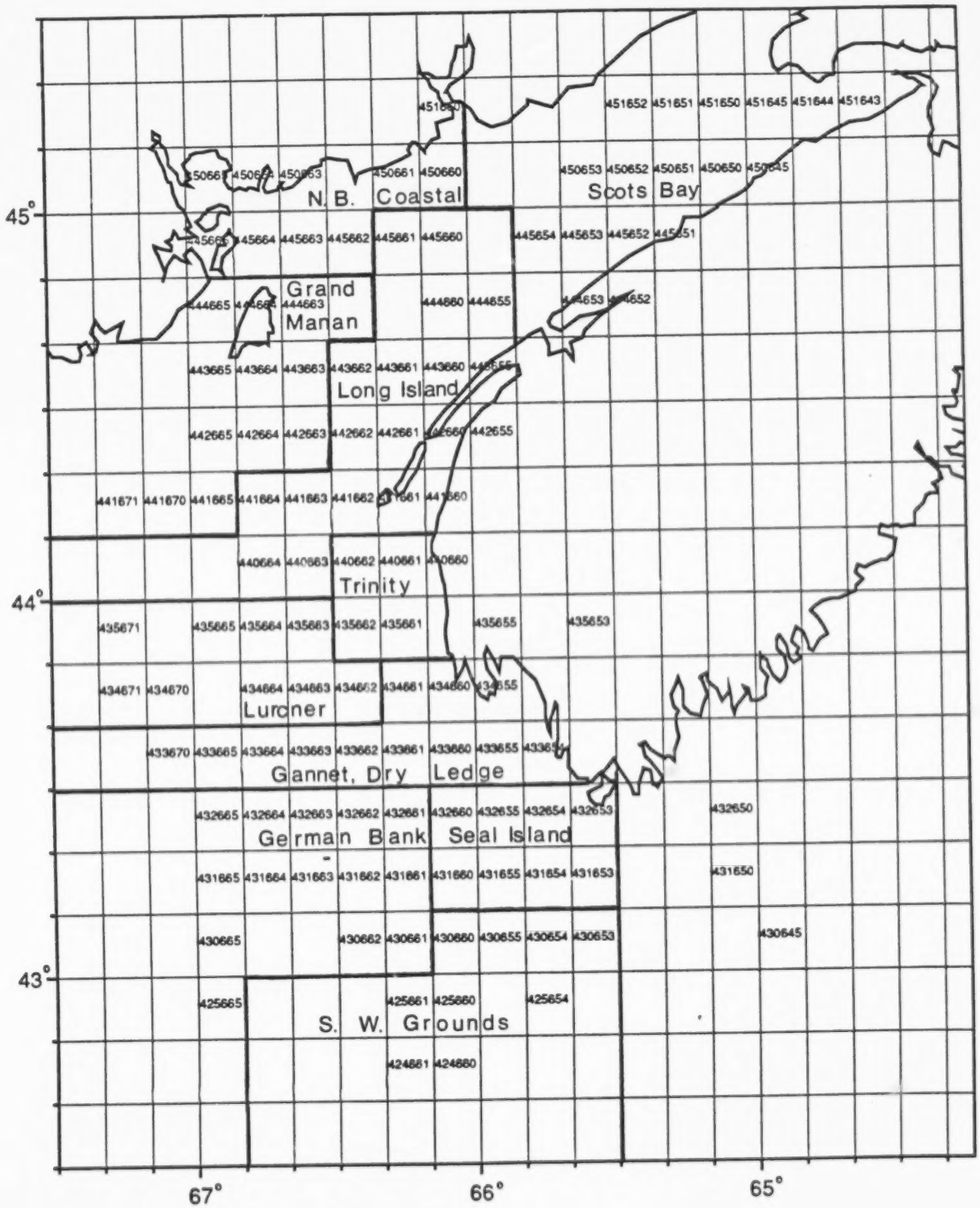

Figure 1. 4Xa purse seine fishing grounds.

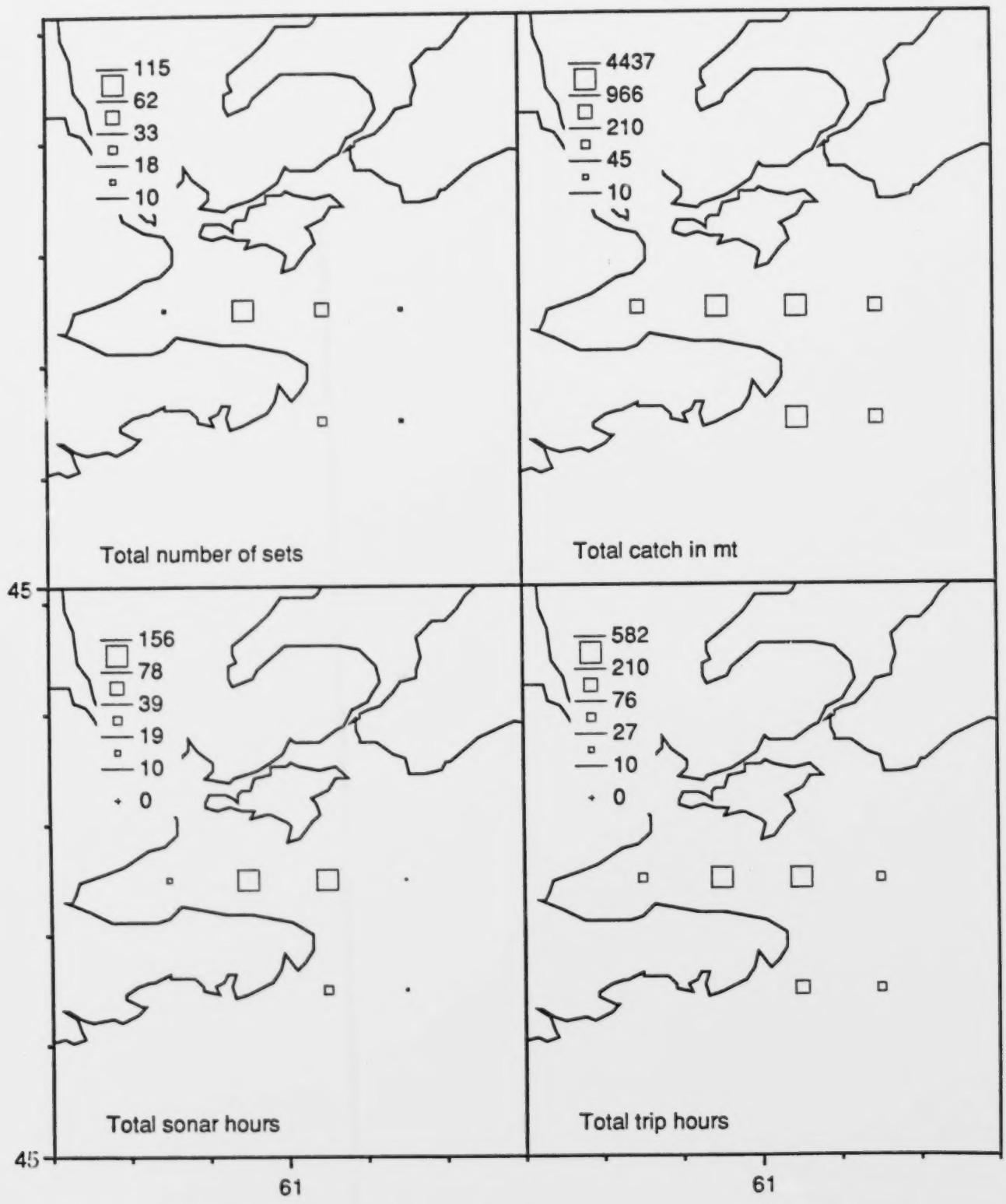

Figure 2. 1989 4W purse seine catch and effort distribution.

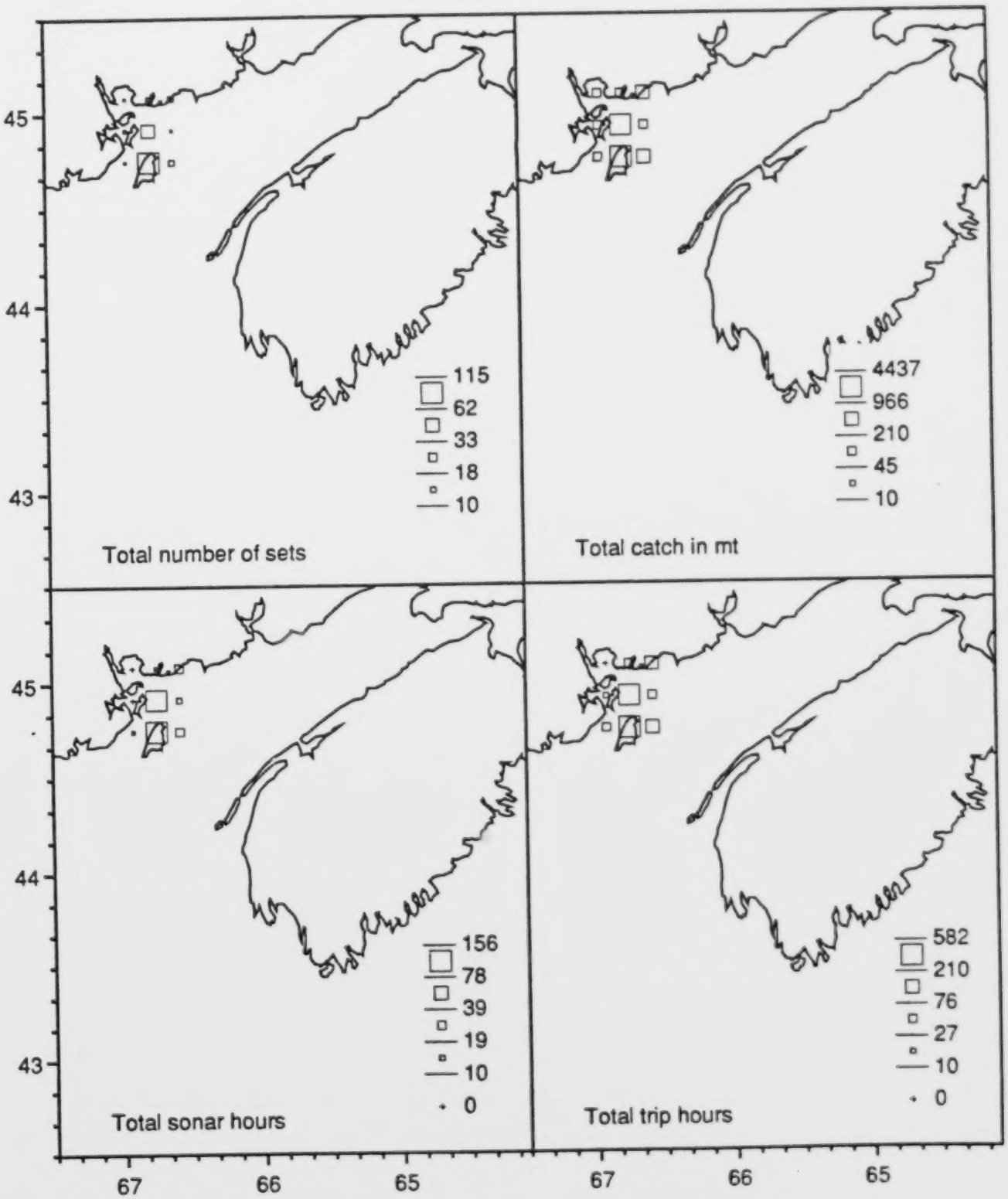

Figure 3. 1989 4Xs New Brunswick purse seine catch and effort distribution.

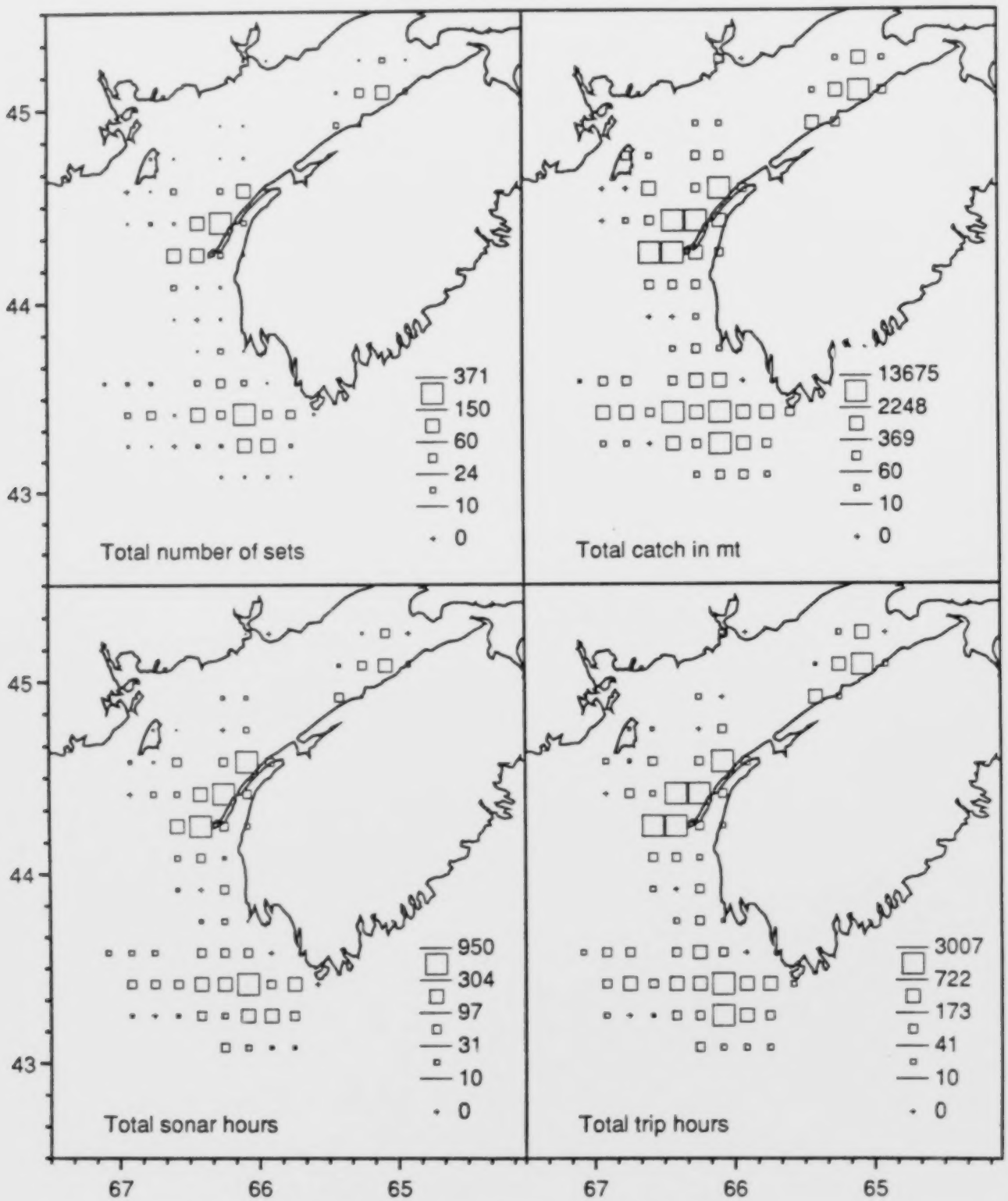

Figure 4. 1989 4X Nova Scotia purse seine catch and effort distribution.

Government of Canada / Gouvernement du Canada

Fisheries and Oceans / Pêches et Océans

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Your file / Votre référence

Our file / Notre référence

May 31, 1990

Capt. [redacted]
Lower West Pubnico
Nova Scotia B0W 2C0
[redacted]

Dear Capt. [redacted]

We wish to thank you again for your cooperation in providing log records of your fishing activities in 1989. These logs have been processed, analyzed and presented in a report at the May 1990 CAFSAC (Canadian Atlantic Fisheries Scientific Advisory Council) meeting as part of the assessment of this fishery. This year we presented a summary of the 5 years of data which we now have from the new logbook format. The logbooks have proved to be invaluable in documenting the purse seine fishery. We will forward a final copy of this document when it becomes available later this year.

The log coverage of the 1989 fishery was excellent, accounting for 94% of the reported catch from Statistics Branch and, in general, the logbooks were completed well. Enclosed you will find the following:

1 - summary printout(s) of your log information, by area, fishing grounds, month and week

2 - detailed printout(s) of your log information, by day and by individual set (in two parts)

3 - summary printout(s) of your 1989 catches with totals by area and fishing grounds. Please refer to the 10-minute square map in your logbooks.

We hope that you find this information useful. If you have any questions or suggestions for improvements, please call (collect) at the above number. In addition, if there are any errors in the final output from your log you would like to see corrected, please let us know.

In 1990 we will continue to process your log in the same manner and will again provide feedback in the form of these standard reports. Thank you in advance for your continued cooperation.

Sincerely,

Michael Power

Dr. Rob Stephenson

Attach.

Canada

1988-89 4WX Purse Seine Logbook Daily Report by Fishery (Part 1 of 2)

BOAT	Area	Year	Dep. Mon.	Dep. Day	Set No.	Set Time	Y-Posn.	X-Posn.	Kept wt.	Market	Fish Size	Roe Stage
[redacted]	4Xa	89	6	25	1	1	4414 4	663210	0.0	-	-	-
				26	1	2130	4412 6	663247	7.7	Fillet	Mixed	-
				28	1	230	440828	663354	3.6	Fillet	-	-
				29	1	2140	441432	663270	3.2	Fillet	-	-
			7	3	1	2200	4415 6	663203	0.0	-	-	-
					2	100	442142	662811	3.6	Fillet	-	-
				4	1	240	4419 1	663000	5.4	Fillet	-	-
				5	1	2130	4413 0	663506	54.4	O.S.S	-	-
				6	-	-	442000	661000	0.0	-	-	-
				7	1	2330	4432 3	660752	22.7	O.S.S	-	-
				8	1	230	443431	660929	45.0	O.S.S	-	-
				9	1	2300	443117	661018	0.0	-	-	-
				11	1	15	443310	660743	5.9	Fillet	-	-
				12	1	2140	442925	661174	7.3	Fillet	-	-
				17	1	2130	442555	661407	36.3	O.S.S	Mixed	-
					2	440	443144	660593	10.9	Fillet	-	-
				18	-	-	442000	661000	0.0	-	-	-
				19	1	2240	4418 4	663310	0.0	-	-	-
				20	-	-	442000	661000	0.0	-	-	-
				21	-	-	442000	661000	0.0	-	-	-
				22	1	200	4321 6	660570	27.2	O.S.S	-	-
				23	1	15	432242	660623	7.3	Fillet	-	-
				24	1	220	432313	660762	4.5	Fillet	-	-
				25	1	2200	431837	655714	3.6	Fillet	-	-
				30	-	-	432000	660000	0.0	-	-	-
				31	1	415	4431 8	660824	7.3	Fillet	-	-
			8	1	1	340	442514	661320	10.9	Fillet	-	-
				2	1	150	442712	661030	7.3	Fillet	Mixed	-
				8	1	500	442518	661497	0.0	O.S.S	Mixed	-
				9	1	315	442158	661626	22.7	O.S.S	-	-
				13	-	-	442000	661000	0.0	-	-	-
				14	-	-	442000	661000	0.0	-	-	-
				20	-	-	442000	661000	0.0	-	-	-
				21	-	-	442000	661000	0.0	-	-	-
					1	2200	432415	660350	0.0	Shore	Mixed	-
				27	1	2300	432130	655901	0.0	-	-	Ripe-soft
				28	1	2220	4321 0	655842	16.3	Fillet	-	-
			9	4	1	2040	4336 2	661358	20.0	Bait	-	-

Pelagic Group, Marine Fish Division, St. Andrews, N.B.

Reported by M.J.Power : 24-MAY-90

1988-89 4WX Purse Seine Logbook Daily Report by Fishery (Part 2 of 2)

BOAT	Area	Year	Dep. Mon.	Dep. Day	Set No.	Set Time	Kept mt.	Release Notes	Comments
[redacted]	4Xa	89	6	25	1	1	0.0	Gear/crew problems	-
				26	1	2130	7.7	-	Little or no fish
				28	1	230	3.6	-	-
				29	1	2140	3.2	-	-
			7	3	1	2200	0.0	Fish too deep	-
					2	100	3.6	-	Hard to catch
				4	1	240	5.4	-	Fish deep
				5	1	2130	54.4	Gave fish away	-
				6	-	-	0.0	No fish found	-
				7	1	2330	22.7	-	Large area of fish
				8	1	230	45.0	-	-
				9	1	2300	0.0	Fish too deep	-
				11	1	15	5.9	-	Poor weather
				12	1	2140	7.3	-	Fish on surface
				17	1	2130	36.3	-	-
					2	440	10.9	-	-
				18	-	-	0.0	No fish found	Fish thinned out
				19	1	2240	0.0	Gear/crew problems	-
				20	-	-	0.0	No fish found	-
				21	-	-	0.0	No fish found	Little or no fish
				22	1	200	27.2	-	Fish thinned out
				23	1	15	7.3	-	Fish thinned out
				24	1	220	4.5	-	Fish in shallow water
				25	1	2200	3.6	-	Little or no fish
				30	-	-	0.0	No fish found	-
				31	1	415	7.3	-	Fish on surface
			8	1	1	340	10.9	-	Hard to catch
				2	1	150	7.3	-	-
				8	1	500	0.0	-	Set made but no catch record
				9	1	315	22.7	-	-
				13	-	-	0.0	Fish too shallow	-
				14	-	-	0.0	Fish too shallow	-
				20	-	-	0.0	Fish too shallow	-
				21	-	-	0.0	Fish too shallow	-
					1	2200	0.0	Size of fish	-
				27	1	2300	0.0	Tore up net	-
				28	1	2220	16.3	-	-
			9	4	1	2040	20.0	-	-

Pelagic Group, Marine Fish Division, St. Andrews, N.B.

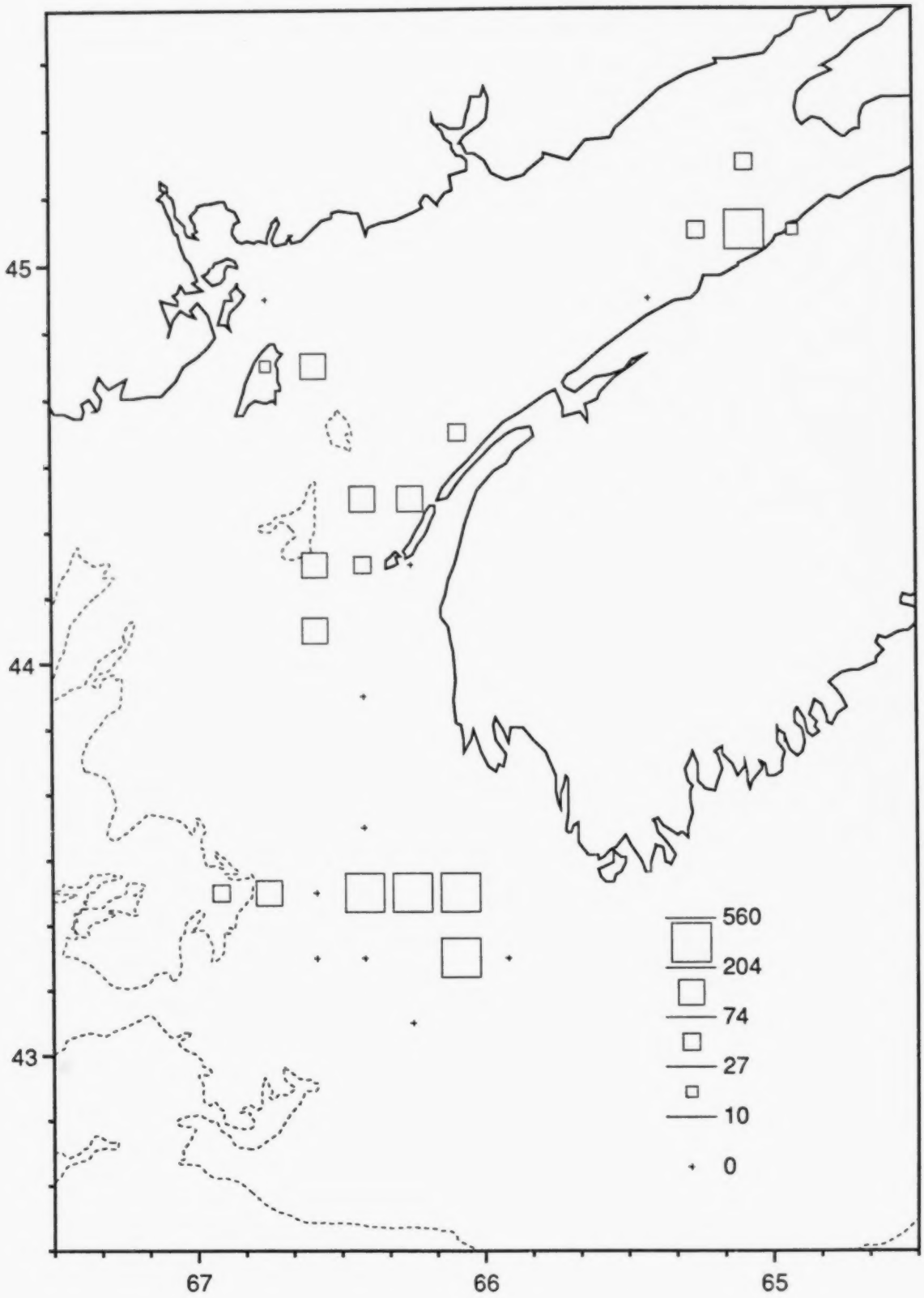
Reported by M.J.Power : 24-MAY-90

1988-89 4VWX Purse Seine Summary by Boat & Grounds and Square

BOAT	Area	Year	Fishing Ground	SQUARE	No. Sets	Catch mt.	Kept mt.	RELEASMT	Trip Hrs.	Sonar Hrs.
[redacted]	4Xe	89	Grand Manan	443663	2	108.9	108.9	0.0	33.2	.6
			Long Island	440663	1	3.6	3.6	0.0	14.3	7.3
				441663	7	70.7	70.7	0.0	74.0	17.1
				442661	6	84.5	84.5	0.0	164.5	82.4
				442662	1	3.6	3.6	0.0	-	-
				443660	5	91.8	91.8	0.0	51.3	18.5
				443661	1	0.0	0.0	0.0	12.3	6.0
			Trinity	440662	1	5.4	5.4	0.0	14.5	6.5
			Lurcher	443662	1	18.1	18.1	0.0	12.3	6.5
			Gannet-Dry Ledge	433661	8	88.1	88.1	0.0	43.8	13.1
				434661	3	34.4	34.4	0.0	13.0	4.9
			Seal Island	431655	1	3.6	3.6	0.0	15.2	5.0
				431660	1	0.0	0.0	0.0	13.0	6.5
				432655	1	16.3	16.3	0.0	22.2	3.5
				432660	16	399.2	372.0	27.2	188.3	79.5
			German Bank	432662	1	99.8	99.8	0.0	15.5	5.8
		Totals			56	1028.0	1000.8	27.2	687.4	262.9

1988-89 4VWX Purse Seine Weekly Summary by Boat & Grounds

BOAT	Area	Year	Fishing Ground	Dep. Mon.	Week No.	No. Sets	Catch mt.	Kept mt.	Trip Hrs.	Sonar Hrs.
[redacted]	4Xa	89	Grand Manan	10	41.0	2	108.9	108.9	33.2	.6
			Long Island	6	26.0	4	14.5	14.5	45.6	11.5
				7	27.0	6	131.1	131.1	69.8	28.3
					28.0	3	13.2	13.2	32.9	10.6
					29.0	3	47.2	47.2	61.2	27.5
					31.0	1	7.3	7.3	14.3	6.6
				8	31.0	2	18.2	18.2	25.9	10.8
					32.0	2	22.7	22.7	22.0	14.1
					33.0	0	0.0	0.0	26.5	15.2
					34.0	0	0.0	0.0	18.2	6.7
			Trinity	9	36.0	1	5.4	5.4	14.5	6.5
			Lurcher	9	36.0	1	18.1	18.1	12.3	6.5
			Gannet,Dry Ledge	9	36.0	6	63.6	63.6	32.8	12.1
					37.0	3	40.8	40.8	13.0	4.9
					39.0	1	18.1	18.1	11.0	1.0
			Seal Island	7	29.0	1	27.2	27.2	13.3	5.3
					30.0	3	15.4	15.4	45.0	17.4
					31.0	0	0.0	0.0	12.0	6.2
				8	34.0	1	27.2	0.0	12.0	3.5
					35.0	2	16.3	16.3	22.2	3.2
				9	37.0	5	156.1	156.1	64.8	25.7
					38.0	7	176.9	176.9	56.4	26.4
				10	41.0	1	0.0	0.0	13.0	6.5
			German Bank	10	41.0	1	99.8	99.8	15.5	5.8
		Totals				56	1028.0	1000.8	687.4	262.9



1989 catches by square for boat # 212